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Study of Different Types of Salts (NaCl) and their Domestic Uses and Side Effects: A Case Study

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ABSTRACT :- Salt is a crystalline mineral made of two elements, Sodium (Na) and Chlorine (Cl). Sodium and chlorine are essential for our body as they help our brain and nerve sends electrical impulses. Salt has various purposes, the most common is to flavour food. Salt is also used as a food preservative and it is essential for human life, but too much salt can raise blood pressure but eating less salt can improve health.

KEYWORDS :- Salt, NaCl, Sea water, Blood pressure, rock salt, halite

I. INTRODUCTION

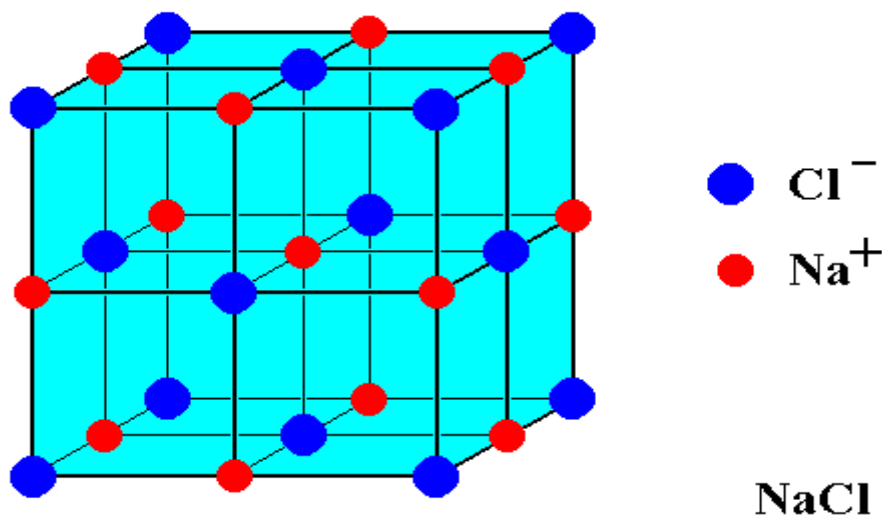
What is salt?

Salt is one of the world's most important cooking ingredients, without it many meals would taste bland and unappealing. Salt is a mineral composed of sodium chloride (NaCl), a chemical compound. Salt is in its natural form as a crystalline mineral known as rock salt or halite. Salt is present in vast quantities in seawater, where it is the main mineral consistent. The open ocean has about 35 grams (1.2 oz) solids per liter of seawater, a salinity of 3.5%. Nutrition facts in salt are zero calories.

How does the structure of NaCl look like?

Salt contains one Sodium (Na) atom and one chlorine (Cl) atom having electronic configuration as Na(11) — $1S^2, 2S^2, 2P^6, 3S^1$ and Cl (17) — $1S^2, 2S^2, 2P^6, 3S^2, 3P^5$ showing that Na donates one electron and chlorine accepts one electron.

NaCl is a face centered cubic (FCC) unit cell which has four cations and 4 anions. The cell looks the same whether we start with anions or cations on the corners. Each ion is 6 co-ordinate and has a local octahedral geometry.





II. TYPES OF SALTS

There are many varieties of salts. These include table salt, Himalayan pink salt, Kosher salt, Sea salt, Celtic salt and Epsom salt. They differ not only in taste and texture but also in mineral and sodium content.

1) Refined Salt (Regular Table Salt) :—The most common salt is regular table salt. This salt is usually highly refined, meaning that it is heavily ground with most of its impurities and trace minerals removed. The heavily ground salt has a problem that it can clump together. For this reason various substances called anti-caking agents are added so that it can flow freely. Food grade table salt is almost pure sodium chloride — 97% or higher, but in many countries including India also contains added iodine. The addition of iodine to table salt is the result of successful public health preservative. Iodine deficiency is a leading cause of hypothyroidism, intellectual disability and various other health problems (3,4).

Therefore, if you choose not to eat regular iodine-enriched table salt, make sure you are eating other foods that are high in iodine, such as fish, dairy, eggs and seaweed.

2) Sea Salt :— Sea salt is made by evaporating sea water. Like table salt, it is mostly just sodium chloride. However depending on its source and how it was processed, it usually contains various trace minerals like potassium, iron and zinc.

The darker sea salt contains microplastics - the microscopic remains of plastic waste. The health implications of microplastics in food are still unclear, but some researchers believe that health risks are low at current levels (5).

Unlike regular refined salt, sea salt often causes as its less ground. If you sprinkle it on your food after cooking, it may have a different mouthfeel and cause a more potent flavour burst than refined salt. The trace minerals and impurities found in sea salt can also affect its taste, but this varies greatly between brands.

3) Himalayan Pink Salt :—Himalayan pink salt is mined in Pakistan. It comes from the Khewra salt mine, the second largest salt mine in the world. Himalayan salt contains trace amounts of iron oxide (rust), which gives it a pink color. It also has small amounts of Calcium, Iron, Potassium and Magnesium making it slightly lower in sodium than regular table salt. Many people prefer the flavour of Himalayan salt over the other salt. However the main difference is simply the color which can make any dish visually appealing.

a) Himalayan salt Lamps :- The popular pink salt is not just for sprinkling apothecaries into decor magazines. The lamps are made from solid Himalayan salt from Pakistan. They are lit from the inside with a bulb and the combination gives off a relatively dim amber light.

The appeal is not just visual. Many people believe that salt lamps have health benefits from curing asthma to detoxing a room. Manufacturers of the lamps claim that they release helpful negative ions into the room and clean the air.

b) Air Ionisation - The benefits of negative air ionisation were discovered by accident in 1998 study on Seasonal Affective Disorder (SAD). The study showed that high intensity negative ion treatment can reduce chlorine depression and SAD.

In the studies, negative air ionisation is created with a machine that adds electrons to oxygen molecules to create a negative ion. Negative ions are also created in nature by crushing ocean waves, radiation and even sunlight. These ions are believed to increase the amount of oxygen in the blood, but researchers are still looking into their exact influence on the body.

So far there are no scientific studies on the ability of Himalayan salt lamps to produce negative ions. However the few ions, if any emitted by the salt lamps, are different from the negative air ion machines used in clinical studies, according to the Columbia university medical centre. The negative ion information centre attempted to test that the negative ion emissions were so low that they could barely be measured.

There is also no evidence that the salt lamps have the same effects on SAD (Seasonal Affective Disorder) and chronic depression.

c) Air Purification :- Many Himalayan salt lamp companies claim that their lamps will help to remove dust and pollution from the air with negative ions. These ions have been shown to kill dust mites and cling to dust to make filtration or clean up easier, but it takes a very high powered ion generator to do so.



A Himalayan crystal salt lamp does not put off enough negative ions to help remove air particulates. There is no evidence that the lamp can absorb toxins. There is no evidence that the sodium chloride, a stable compound, can absorb toxins through the air.

There is no evidence that Himalayan salt lamps release negative ions or clean the air. The best way to add negative ions to our home is with a commercial ionization machine that can produce high density ionization.

4) Kosher Salt :- Kosher salt has a longer grain size that makes it suitable for the koshering process. Traditional Jewish law requires blood to be extracted from meat before it is eaten. Because Kosher salt has a flexy, coarse structure, it is particularly efficient at extracting blood.

One teaspoon of Kosher salt contains 1120 milligrams of sodium.

The main difference between regular salt and Kosher salt is the structure of the flakes. Chels find that Kosher salt due to its larger flake size, is easier to pick up with our fingers and spread over food. Kosher salt will have a different texture and flavor burst, but if we allow the salt to dissolve in the food, there really is not any difference compared to regular table salt.

However Kosher salt is less likely to contain additives like anti-caking agents and Iodine. Yet keep in mind that teaspoon of Kosher salt weights for less than a teaspoon of regular salt. Do not substitute one for the other at a 1:1 ratio for our food, may end upto salty or too bland.

5) Celtic Salt :- Celtic salt is a type of sea salt that originally became popular in France. It has grayish color and also contains a bit of water, which makes it quite moist.

Celtic salt offers a trace amount of minerals and it is a bit lower in sodium than plain table salt. Celtic salt is different in taste as compared to plain table salt. Foodies and Chefs primarily choose their salt based on taste, texture, color and convenience. Impurities including trace minerals can affect both color and taste of the salt.

The size of grain also affects how the salty flavor hits our tongue. Salt with a larger grain size can have a stronger flavour and last longer on your tongue. However, if we allow the salt to dissolve in our dish, there should not be any major taste difference between plain refined salt and other gourmet salts.

6) Epsom Salt :- Epsom salt is a popular remedy for many ailments. People use it to ease health problems, such as muscle soreness and stress. It is also affordable, easy to use and harmless when used appropriately.

Epsom salt is also known as magnesium sulphate. It is a chemical compound made up of magnesium, sulfur and oxygen. It gets its name from the town of Epsom in Surrey, England where it was originally discovered. Despite its name Epsom salt is a completely different compound than refined table salt. It was most likely termed "salt" because of its chemical structure.

It has an appearance similar to table salt and is often dissolved in baths, which is why we may also know it as "bath salt", while it looks similar to table salt its taste is distinctly different. Epsom salt is quite bitter and unpalatable.

Some people still consume it by dissolving the salt in water and drinking it. However due to its taste, we probably don't want to add it to food.

For hundreds of years this salt has been used to treat ailments, such as constipation, insomnia and Fibromyalgia. Unfortunately, its effect on these conditions are not well researched.

When Epsom salt is dissolved in water it releases magnesium and sulfate ions. The idea is that these particles can be absorbed through our skin, providing us with magnesium and sulfates which serve important bodily functions.

However it can also be applied to our skin as cosmetic or taken by mouth as a magnesium supplement or a laxative. There are many Health Benefits and uses of Epsom salts reported. Many people claim Epsom salt is therapeutic and use it as an alternative treatment for several conditions.

Mainly Epsom salt provides magnesium. Magnesium is the fourth most abundant mineral in the body, the first being calcium. Many people do not consume enough magnesium, even if you do, factors such as dietary phytates and oxalates can interfere with how much your body absorbs(2).

While magnesium sulfate has value as a magnesium supplement, some people claim that magnesium may be better absorbed via Epsom salt bath, than when taken by mouth. This claim is not based on any available evidence.

Proponents of the theory point to an unpublished study in 19 healthy people. The researchers claimed that all but three of the participants showed higher blood magnesium levels after soaking in an Epsom salt bath. However there were no statistical tests performed and the study lacked a control group(3).

As a result its conclusions were unfounded and highly questionable. Researchers agree that magnesium is not absorbed through people's skin-at least not in any scientifically relevant amounts(1).

Epsom salt is useful for promoting sleep and stress reduction. Adequate magnesium levels are essential for sleep and stress management, likely because magnesium helps your brain produce neurotransmitters that induce sleep and reduce stress(4). Magnesium may also help your body produce melatonin, a hormone that promotes sleep(5).

Low magnesium levels may negatively affect sleep and stress. Some people claim that taking Epsom salt bath can reverse these issues by allowing our body to absorb magnesium through the skin.

Magnesium is often used to treat constipation. It appears to be helpful because it draws water into your colon, which promotes bowel movements(6,7).

However taking Epsom salt is also said to be effective although it is not well studied. Nevertheless, the FDA lists it as an approved laxative. It can be taken by mouth with water according to the directions on the package.

Adults are usually advised to take 2 - 6 teaspoons (10-30 grams) of Epsom salt at a time, dissolved in at least 8 ounces (237 ml) of water and consumed immediately. You can expect a laxative effect in 30 minutes to 6 hours.

You should also know that consuming Epsom salt may produce unpleasant side effects such as bloating and liquid stool(7). It should only be used occasionally as a laxative not for long term relief.

Here are a few of the most common ways to use Epsom salt.

1) **Bath :-** The most common use is taking Epsom salt baths. To do this add 2 cups (about 475 grams) of Epsom salt to the water in a standard size bathtub and soak your body for at least 15 minutes. We can also put the Epsom salt under running water if you want it to dissolve more quickly. While hot baths can be relaxing, there is currently no good evidence for the benefits of an Epsom salt bath in itself.

2) **Beauty :-** Epsom salt may be used as a beauty product for skin and hair. To use it as an exfoliant just place some in your hand, dampen it and massage it into your skin.

Some people claim that it is a useful addition to facial wash, since it may help cleanse pores. Just a ½ teaspoon (2.5 grams) will do the trick. Simply combine it with your own cleansing cream and massage onto the skin.

It can also be added to the conditioner and may help add volume to your hair. For this effect, combine equal parts conditioner and Epsom salt. Work the mixture through your hair and leave for 20 minutes then rinse.

These uses are entirely anecdotal and unsupported by any studies. Remember that it works differently for everyone and that you may not experience the reported benefits.

3) **Laxative :-** Epsom salt can be taken by mouth as a magnesium supplement or as a laxative. Most brands recommended taking 2 - 6 teaspoons (10 - 30 grams) per day, dissolved in water, as a maximum for adults. Approximately 1 - 2 teaspoons (5 - 10 grams) is generally enough for children.

If you want to begin taking Epsom salt by mouth, start slowly. Try consuming 1-2 teaspoons (5-10 grams) at a time and gradually increase the dose as needed.

Remember that everyone's magnesium needs are different. You may need more or less than the recommended dose, depending on how your body reacts and what exactly you are using it for.

Additionally when consuming Epsom salt make sure to use pure, supplement grade Epsom salt that does not have any added scents or coloring.

4) **Reduced Pain and Swelling :-** Another common claim is that Epsom salt helps to reduce pain and swelling. Many people report that taking Epsom salt baths improve symptoms of fibromyalgia and arthritis.

Again the magnesium is deemed responsible for these effects, since many people with fibromyalgia and arthritis are deficient in this mineral.

One study in 15 women with fibromyalgia concluded that applying magnesium chloride to the skin may be beneficial for reducing symptoms(9).

5) **Safety and side effects :-** While Epsom salt is generally safe there are a few negative effects that can occur if you use it incorrectly. This is only a concern when you take it by mouth. First of all the magnesium sulfate in it can have a laxative effect. Consuming it may result in diarrhea, bloating or upset stomach.

If you use it as a laxative, make sure to drink plenty of water, which may reduce digestive discomfort. Furthermore, never take more than recommended dosage without first consulting your doctor.

Some cases of magnesium overdose have been reported, in which people took too much Epsom salt, symptoms include nausea, headache, lightheadedness and flushed skin(2,10).

In extreme cases magnesium overdoses can lead to heart problems, coma, paralysis and death. This is unlikely as large as you take it in appropriate amounts as recommended by your doctor, or listed on the package(2,10).

Immediately contact your doctor if you experience signs of an allergic reaction or other serious side effects.

Mineral Content :- One study determined the mineral content of different types of salts(6). The following table shows a comparison between Table salt, Maldon salt (sea salt), Himalayan salt and Celtic salt.



Types of Salts	Calcium	Potassium	Magnesium	Iron	Sodium
Table salt	0.03 %	0.09 %	< 0.01 %	< 0.01 %	39.1 %
Maldon salt	0.16 %	0.08 %	0.05 %	< 0.01 %	38.3 %
Himalayan salt	0.16 %	0.28 %	0.1 %	0.0004 %	36.8 %
Celtic salt	0.17 %	0.16 %	0.3 %	0.014 %	33.8 %

As in the above table we can see Celtic salt has the least amount of sodium and the highest amount of Calcium and Magnesium. Himalayan salt contains a bit of potassium. However keep in mind that these are in trace amounts. For example the 0.3% content of magnesium for Celtic salt implies that you would need to eat 100 grams of salt to reach the RDI. (Recommended Dietary Intake)

Nutrition Facts :- The nutrition facts of salt are as follows-

Sources include - USDA

Amounts per 100 grams

Calories 0

Total fat	0 g	% Daily Value *	0 %
Saturated fat	0 g		0 %
Polyunsaturated fat	0 g		
Monounsaturated fat	0 g		
Cholesterol	0 mg		0 %
Sodium	38,758 mg		1614 %
Potassium	8 mg		0 %
Total Carbohydrate	0 g		0 %
Dietary Fibre	0 g		0 %
Sugar	0 g		0 %
Protein	0 g		0 %

Vitamin A	0 %	Vitamin C	0 %
Calcium	2 %	Iron	1 %
Vitamin D	0 %	Vitamin B-6	0 %
Cobalamin	0 %	Magnesium	0 %

* Percent daily values are based on a 2000 calorie diet. Your daily values may be higher or lower depending on your calorie needs.

III. CONCLUSION

From all of the above brief conclusions are as follows-

- 1) Refined salt is mostly composed of sodium chloride, with anti-caking agents added to prevent clumping. Iodine is often added to table salt as well.



- 2) Sea salt is made by evaporating sea water. Though very similar to regular salt, it may contain small amounts of minerals. It also contains trace amounts of heavy metals and microplastics.
- 3) Himalayan salt is harvested from a large salt mine in Pakistan. It has a pink color due to the presence of iron oxide. It also contains trace amounts of calcium, potassium and magnesium.
- 4) Kosher salt has a flaky structure that makes it easy to spread atop our food. Though it is not much different than regular salt, it's less likely to contain anti-caking agents and added iodine.
- 5) Celtic salt has a light grayish color and is quite moist. It is made from seawater and contains trace amounts of minerals.

The main differences between salts are flavour, color, texture and convenience.

- 6) Salts contain only trace amounts of minerals, as a result choosing one type of salt over another is unlikely to significantly affect your health.

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